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SHORT COMMUNICATIONS

Ribonuclease from *Bacillus pumilus* Prevents HSV-1 Entrance into the Cell and Reproduction

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Abstract—Herpes simplex virus type 1 is a highly contagious worldwide prevalent infection, which, once it enters the organism, persists during its whole lifetime. According to World Health Organization estimates, about 3.7 billion people under the age of 50 years (90% of the human population) are infected with by HSV-1 worldwide. The important role played by ribonucleases (RNases) in protection of the cell and whole organism from viruses has been confirmed by a considerable body of data that allow considering RNases not only as immune system components, but also as a basis for development of the new antiviral drugs. The purpose of the present work was to demonstrate the antiviral activity of the RNase from *Bacillus pumilus* (binase) toward HSV-1 at the cell entrance and reproduction stages. Virus treatment with binase in the concentration of 100 μg/mL for 60 min reduced virus replication in the bovine kidney epithelial cell culture MDBK by 100 times compared with untreated virus. Development of cytopathic effects produced by untreated virus in the cells grown on the medium with binase was retarded by 7 h compared with the growth of virus-infected cells on the medium without binase. It may be suggested that HSV-1 treatment with RNases reduces its ability to enter the cell; antiviral action of RNases toward the intracellular virus is realized at the initial stage of virus reproduction.

Keywords: herpes simplex virus HSV-1, *Bacillus pumilus* RNase, binase, virus replication, cytopathic effect, antiviral activity

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INTRODUCTION

The importance of herpes virus infection as a critical medical and social problem increases every year due to its ubiquitous distribution, persistence in the organism in latent form, high frequency of reactivation, and. finally, carcinogenicity of certain viruses [1, 2]. The family Herpesviridae includes more than 80 representatives, 8 antigenic serotypes among them being pathogenic for human beings. Antibodies against these viruses are detected in 80–90% of adult people [3]. Herpes viruses may exist in the organism in three main forms, namely, in extracellular and intracellular forms and as a part of immune complexes, which largely determines their sensitivity to different antivirus chemotherapeutic agents, immunomodulators, and symptom-relieving drugs [4]. Although incorporation of panavir and acyclovir in the complex therapy contributes to a more pronounced clinical effect, in most cases, occasional use of virostatics does not protect from subsequent remissions [4]. In this view, the search for the new antiviral agents is a critical task.

That a role is played by RNases in the protection of cells and the whole organism from viruses is supported by a considerable body of data, which allow considering RNases not solely as components of the immune system, but also as the basis for development of the new antiviral drugs [5]. Our previous studies have shown that secreted RNase from *Bacillus pumilus* (binase) inhibits reproduction of the serotype I reovirus [6] and appears to be a promising agent to serve basis for the development of the drug against pandemic influenza virus [7, 8].

In view of the above, the aim of the present work was to demonstrate the antiviral activity of bacillar RNase (binase) toward herpes simplex virus HSV-1 at the cell entry and reproduction stages.

MATERIALS AND METHODS

Virus and cell culture. The work was carried out using the attenuated herpes simplex virus type 1 strain TK-A(VIEV)V-2 (HSV-1) (from the collection of the Kovalenko All-Russia Research Institute of Experimental Veterinary, Moscow) and the passaged line of